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(54) **PHYSICALLY FUNCTIONAL MATERIALS**

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**2**

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(57) **ABSTRACT**

The invention relates to novel monodisperse or polydisperse compounds, in general named DNO (diamino acid N $\alpha$ -substituted oligopeptides), preferably low molecular weight polypeptides, e.g., based on ornithine, lysine, diaminobutyric acid, diaminopropionic acid, aminoethylglycine or other amino acids or peptides having azobenzenes or other physically functional groups, e.g., photoresponsive groups, as side chains. These compounds may be synthesized using solid phase peptide synthesis techniques. Materials, e.g., thin films, comprising such compounds may be used for optical storage of information (holographic data storage), nonlinear optics (NLO), as photoconductors, photonic band-gap materials, electrically conducting materials, electroluminescent materials, piezo-electric materials, pyro-electric materials, magnetic materials, ferromagnetic materials, ferroelectric materials, photorefractive materials, or materials in which light-induced conformational changes can be produced. Optical anisotropy may reversibly be generated with polarized laser light whereby a hologram is formed. First order diffraction efficiencies of up to around 80% have been obtained.



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**United States Patent** [19][11] **Patent Number:** **5,496,670****Hvilsted et al.**[45] **Date of Patent:** **Mar. 5, 1996**[54] **OPTICAL STORAGE MEDIUM**[75] **Inventors:** Søren Hvilsted, Hørsholm; P. S. Ramanujam, Roskilde, both of Denmark; Fulvio Andruzzi, Pisa, Italy[73] **Assignees:** Risø National Laboratory, Roskilde, Denmark; Consiglio Nazionale della Ricerche, Rome, Italy

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[57] **ABSTRACT**

A macroscopically isotropic side chain liquid crystal polymer is described containing photochromic mesogenic groups and which through irradiation with light is capable of being permanently or substantially permanently converted into an optically anisotropic phase without having been pre-oriented. The polymer is preferably a polyester between on the one hand either an aliphatic, optionally substituted,  $\alpha,\omega$ -dicarboxylic acid having a total chain length of up to 24 carbon atoms, or an aryl-, in particular phenyl-, carboxylic acid, and on the other hand an optionally substituted 1,3-propanediol containing the mesogenic group, or a group containing the mesogenic group, attached to the carbon in the 2-position. Furthermore, an optical storage device comprising a film of the polymer.

**43 Claims, 5 Drawing Sheets**